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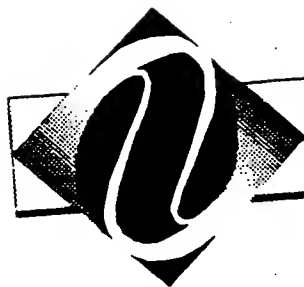
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Physicians' Online

TM

Physicians' Prescribing Network

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Steven Hochberg
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PHYSICIANS' ONLINE, Inc.

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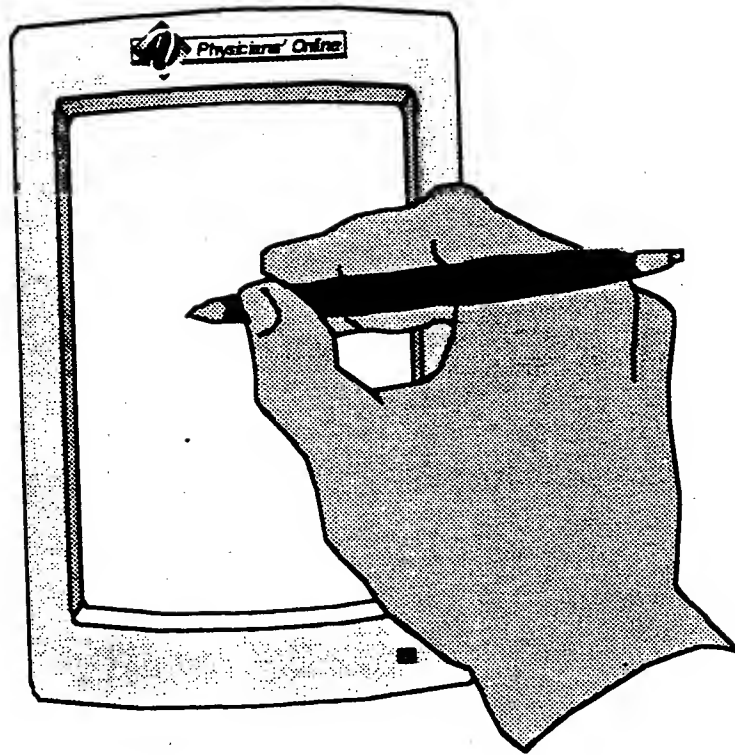
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Physicians' Prescribing Network

Physicians' Prescribing Network (PPN) is an online interactive prescription ordering system linking physicians with the pharmacist and mail order suppliers via an industry supported EDI network to provide patients and plan sponsors with an ability to maximize out-patient prescription cost-containment benefits. PPN is designed to complement existing distribution and claims processing networks by linking them directly to the physician.

The convergence of escalating health care costs and the advance of information technology has paved the way for the formation of PPN. While there are a few companies that currently provide pharmaceutical benefit programs for plan sponsors, none have identified a cost effective means of linking the out-patient physician with their well-developed cost-containment and utilization information systems. PPN has developed a cost-effective means to create the required link to the physician.

By creating an industry-wide network, PPN will link physicians, on a wireless basis, directly into all pharmaceutical benefits programs. This linkage will create the tools to empower the physician to increase the quality and lower the cost of prescription drugs in the \$40 billion out-patient prescription drug market. These tools include an online formulary, online prospective drug utilization review, electronic transmission of prescriptions to pharmacists, and online access to other information and services.

PPN will provide physicians with the necessary hardware, while the pharmaceutical benefits programs will pay PPN a transaction fee for each prescription. While certain pharmaceutical drug programs may consider creating their own proprietary network, PPN does not believe that a physician will use multiple systems and multiple input devices with multiple interfaces. Instead, successful implementation will require a single universal method to provide drug benefit program information to physicians during the normal prescription writing process. This industry-wide approach is designed to help physicians accept this new technology into their mobile work environment and to avoid the failures that other proprietary network efforts have experienced.

PPN is being organized by Physicians' Online, Inc. (POL), a personalized online medical information and communications service dedicated to empowering physicians with the tools essential to advance the quality and control the cost of health care through informed decision-making. Physicians' Online projects at least 20,000 physician members will be using its online reference, diagnosis, and treatment services by the beginning of 1994. Physicians' Prescribing Network will begin operations in 1994 with a potential membership of over 450,000 physicians. (see Appendix)

PPN is currently in discussion with every major pharmaceutical benefits company and several large physician groups regarding this effort. In addition, PPN is commissioning a health policy consulting group in Washington to study the impact of this effort.

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KEY FEATURES OF PHYSICIANS' PRESCRIBING NETWORK

1. PPN is designed by physicians for physician use. Member physicians can utilize the Network regardless of which plan sponsor or patient is involved.
2. PPN is "open" to all plan sponsors, physicians, retail pharmacists, and mail-order suppliers. However, since physicians will not use a system that does not include all plan sponsors, industry-wide participation is required.
3. *Smart Scripts* enables physicians to maximize patient and plan sponsor cost containment benefits by providing the relevant information during the time of prescription writing.
4. Formularies are continuously updated.
5. PPN lowers transaction costs by eliminating paperwork, waiting time, and avoiding miscommunication between pharmacists and physicians.
6. PPN security eliminates unauthorized prescriptions.
7. PPN provides prescription drug benefits providers, retail pharmacists and mail order suppliers with an ability to offer new products/services.
8. PPN utilizes wireless digital radio technology to assist mobile physicians.
9. PPN is hardware independent allowing for maximum access and changing technologies.
10. The initial hardware expense necessary to establish PPN will be minimized by spreading it across a broad industry alliance.
11. PPN is designed to integrate with claims processing information requirements.
12. PPN is designed to access patient record information.

MANAGED CARE OF PRESCRIPTION DRUG BENEFITS

With the public's concern about "runaway and increasing" costs of health care, numerous efforts are underway to lower such costs through programs focusing on practice utilization areas rather than the traditional price controls. In fact, programs that have focused primarily on price controls have been relatively unsuccessful so far because utilization has increased in such programs thus eliminating any benefits from price reductions. However, utilization management, particularly for patient management, requires physician participation and superior information management.

In the area of pharmaceutical drug benefit management, employers can separate out this benefit from the rest of its health care plan which currently account for about 7% of employers' total health care costs. By "carving out" and applying managed care techniques to the pharmaceutical benefit, the employer can better track costs, control utilization, decrease risk, and often lower the premium for the remaining health care benefits which are generally administered by traditional indemnity or managed care companies. Currently, approximately 20% of employers currently carve out pharmaceutical benefits.

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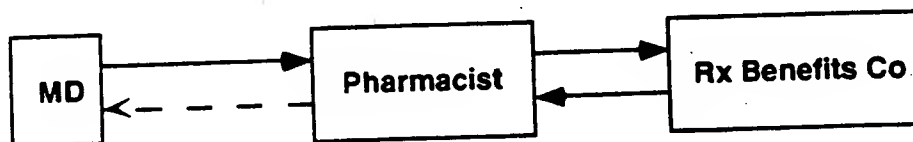
A major business opportunity for managed care companies has emerged through the intense need for management of rapidly growing pharmacy benefit costs", says Alex. Brown & Sons. "In fact, the prescription drug segment of health care costs is one of the fastest-growing components of the health care equation that can equal one-third of total post-retiree health care benefits." While there are currently only a few national companies that compete in this segment, a significant investment in information technology is required to provide the following basic services:

Formulary: A formulary guides physician prescribing by listing drugs preferred for treating specific illnesses. Since there are several competing products in most therapeutic prescription drug classes, health care buyers, organizers and providers are beginning to identify their own preferred therapeutic substitutions through clinical review, chemical analysis, and negotiated supply agreements with different pharmaceutical manufacturers. While there are more than 6,000 prescription drugs available today, within 36 therapeutic classes, 110 drugs represent 80% of all prescription drug expenditures.

In each therapeutic category, the physician is given a choice of drugs to prescribe. Unless a patient has a medical need for a different drug, the most effective and lowest-cost option is the preferred prescription choice. Formularies can be mandated or used for prescribing guidelines. In 1992, about 80% of HMOs used formularies compared to 44% in 1990. In participating HMOs, formulary drugs are used to fill prescriptions about 87% of the time primarily involving staff physicians which are only responsible for one formulary.

The first problem facing out-patient physicians today is that with the plethora of prescription drug benefit plans, which currently only cover 50% of the out-patient prescription drug expenditures, formulary based cost-containment are ineffective if physicians have different patients on different plans and if they have no idea what are the preferred prescription choices when they write a prescription. This problem will continue to increase as patient coverage and the number of drug plans increase.

The second problem facing the formulary is that the feedback loop back to the physician is expensive and ineffective. First, the companies that manage the pharmaceutical benefit employ staffs of pharmacists to contact physicians when there is a potential therapeutic alternative. Unfortunately, this effort is retrospective and uses traditional communications channels which may not occur for several days after the prescription is written and may not result in a "counter-detail" of the physician because they still have the final decision-making responsibility. As more patients are covered by such plans, the communication with the physician is going to become more difficult as they have more patients and less time to respond.



Drug Utilization Review (DUR): According to Alex. Brown, "DUR monitors prescribing patterns to identify inappropriate or unnecessary prescription practices in three ways: (1) prospective review, which requires pre-authorization for specific drugs; (2) concurrent DUR, which adjudicates claims electronically and screens for adverse interactions as the prescription is filled; and (3) retrospective review, which assesses the patient's history to predict potential future adverse reactions to particular drugs or combinations of drugs over time."

Similar to the formulary, there is no current way to adequately inform the out-patient physician of any problems. Again, all communication is attempted on a retrospective basis.

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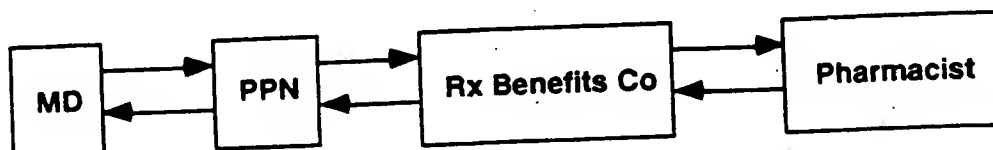
INFORMATION TECHNOLOGY AND PHYSICIAN USE

Since physicians are mobile professionals, the current information technology resident on the desktop or at the home is not very effective for point of service assistance. Fortunately, through the miniaturization of semiconductors, the development of software with "friendly" graphic user interfaces, and the ability to communicate through wireless devices, the physician can be linked into information systems that encourage utilization management and complement the mobile work environment. PPN will rely on a new class of electronic devices known as Personal Digital Assistants (PDAs). PDAs are low-cost easy-to-use pocket-sized pen-based computers which allow mobile professionals such as physicians to communicate from anywhere over wireless networks.

PHYSICIANS' PRESCRIBING NETWORK SERVICES

1. Online Formulary: With the cooperation of the leading companies that manage prescription drug benefit programs, PPN links the physician with the various formularies through an electronic prescription pad ("Smart Script") which helps the physician identify the preferred prescription choice at the point of prescription writing. PPN's proprietary Smart Scripts software allows for continuous updating of formularies and seamless integration into the prescription writing process.

No matter which plan a patient is covered by, while the physician is writing a prescription, he is made aware of any therapeutic alternatives at the appropriate time. This will obviate the need for pharmacists to retrospectively contact the physician about such alternatives.



2. Online Prospective Drug Utilization Review (DUR): Through the link with pharmaceutical benefit programs, a physician will be able to complete a prospective DUR by electronically accessing the patient's drug history. This review procedure can avoid duplication of therapy and avoid drug interaction and allergy problems.

3. Electronic Transmission of Prescriptions to Pharmacists: Through the link with the pharmaceutical benefit programs, the patient can direct the prescription to the retail or mail-order distribution outlet of their choice. This linkage will eliminate paper and patient time at the pharmacy.

4. Online access to other information and services: In addition, the pharmaceutical benefit programs can create additional services through the link with the physician. These services can include, full drug information, patient eligibility verification, patient instructions, sample ordering, refill alerts, and step therapy alternatives.

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PHARMACEUTICAL BENEFITS PROGRAMS

Pharmaceutical Benefits Programs are managed by a handful of companies which have invested hundreds of millions of dollars in information systems to provide Formulary and Drug Utilization Review capabilities for both large employers, HMOs and other plan sponsors. In fact, while HMOs may have ample purchasing power to pursue this business for themselves, millions of lives are necessary to recoup the cost of these investments. For example, FHP, one of California's largest and oldest HMOs, just entered into an agreement with one of the following companies to "buy" rather than "make" its pharmaceutical benefits program. These companies include (*):

Caremark, formerly a division of Baxter, is \$1.5 billion supplier of integrated services including drug benefits, home infusion, and physician services. The company's integrated drug benefit programs serve more than 8.0 million people.

Diversified Pharmaceutical Services (United HealthCare), a subsidiary of a national HMO, offers pharmacy networks and claims processing products that use group purchasing power and utilization control techniques to contain health care costs. United provides managed pharmaceutical care to approximately 7.5 million people in this subsidiary, which is one of the fastest growing segments of its business and now comprises about 15% of profits. Diversified's primary market is other HMOs.

Express Scripts is one of the nation's few fully integrated pharmacy benefit managers, servicing plan sponsors through a preferred network of retailers and an in-house mail-order facility. Founded by NY Life in 1986 primarily to manage its drug benefit for its 650,000 Sanus (HMO) subscribers, Express Scripts has branched out to nonrelated customers and now serves over 3 million people. Group purchasing, formulary compliance, and substantive drug utilization review contribute to savings of 25-35% on plan-sponsor pharmacy costs. Express has recently entered into a five year exclusive agreement with FHP, a California HMO.

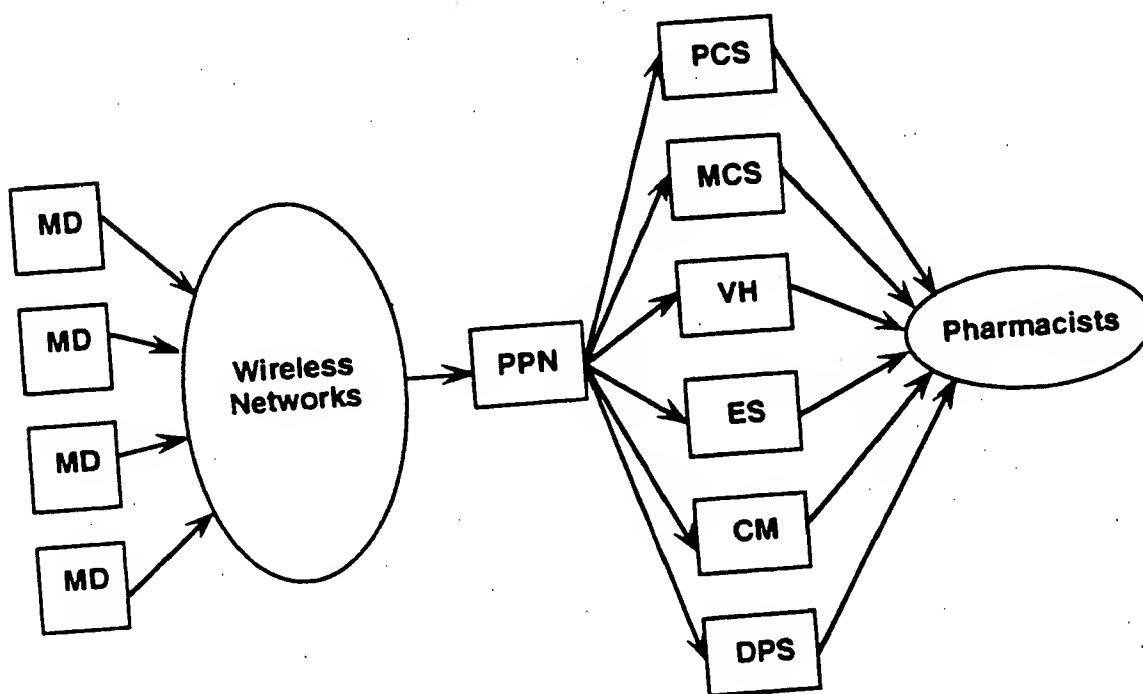
Medco Containment Services is a leader in the pharmacy management business, serving 33 million people through integrated retail and mail-order pharmacies. Medco has integrated formularies, which allow its national customer base to benefit from exclusive, discount contracts with manufacturers for "preferred" cost-effective drugs, and aggressive drug utilization reviews. Medco is actually changing physician prescribing patterns through education. With this trend and the loss of the pricing pedal in the U.S. market, drug companies are rapidly recognizing Medco's ability to drive market share through active education of physicians of cost-effective alternative therapies. In response, they are entering into market-share-driven exclusive rebate contracts with Medco. In addition, Medco has added other special services such as employee assistance programs, mental health management and institutional pharmacy to serve nursing homes and prisons.

PCS Health Systems (McKesson) is the nation's largest processor of prescription claims, amounting to almost 25% of the out-patient drug market. While PCS's core business has been to supply traditional indemnity plans, the market is moving to managed care programs. PCS just recently acquired Clinical Pharmaceuticals, Inc. and its Clinical Pharmacy Advantage which provide integrated managed prescription benefits programs. In addition, PCS has been selected by the National Electronic Information Corporation to streamline the system and electronically process claims for this group of insurance companies. This puts PCS in the center of the development of important standards for the development of the electronic patient record. McKesson Drug Co. is the world's largest distributor of Pharmaceuticals and other health care products. McKesson had more than \$10 billion of total corporate revenues for 1992.

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Value Health is the leading independent provider of managed care pharmaceutical products to large, self-insured employers through its ValueRx subsidiary, which presently serves about 7.5 million people, and accounts for about 70% of revenues. With more large employers migrating to self-insuring and to carving-out prescription benefits, Value has been aggressively increasing its product line to meet this growing market segment.



(*) Much of this information was obtained from Alex. Brown & Sons publications.

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PHYSICIANS' PRESCRIBING NETWORK

Organizational Planning

<u>Item</u>	<u>Participants</u>	<u>Dates</u>	<u>Req Funding</u>
Organize Physicians	P.O.L. Physician Groups	Current	NA
Organize Technology	P.O.L. General Magic Motorola/ARDIS Apple	Current	NA
<ul style="list-style-type: none"> • Prototype • System Design 	ARDIS Bus. Partner Solutions	June 7	NA TBD
Study Cost Benefits	Lewin or other	Current	TBD
Organize Plan Sponsors <ul style="list-style-type: none"> • Collect Formulary Data 	McKesson, Medco. Caremark, Divrsd, Express, Value, etc.	Current	NA
Review State Pharmacy Laws and Work with Boards/ Lawyers	LeBeouf, Lamb	Current	TBD
Develop Smart Script Software <ul style="list-style-type: none"> • Feature Design • Integration of Patient Record & Claims Processing 	P.O.L. Medical Societies Genl. Magic Ref. NEIC	Current	TBD
Regional Pilot Test Program	Lenox Hill Hospital Others TBD	Fall '93	TBD
Hardware Devices to Top 5% of MD Prescribers	Motorola/Apple Private Investors	1Q '94	TBD
Hardware Devices To Remaining MD's	Capital Markets	2Q '94	TBD

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APPENDIX

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Physicians' Online, Inc.

Physicians' Online is a personalized online medical information and communications service dedicated to empowering physicians with the tools essential to advance the quality and control the cost of health care through informed decision-making.

Physicians' Online ("Company") is an innovative new electronic medium designed to evolve into a comprehensive national medical information and communications network servicing the entire health care industry. The Company's online information products and communication services provide physicians with powerful tools to manage Medical Knowledge, Prescriptions, and Patients. *Physicians' Online* provides a distribution outlet for third-party produced information products and services. *Physicians' Online* also provides valuable proprietary information services to other industry participants including managed care organizations and the pharmaceutical industry.

Phase I - Medical Knowledge Management

Online medical information and communication services which are readily accessible and free of charge to member physicians through optional online advertising support. The Company has assembled the most powerful, yet user-friendly, collection of medical information tools available from leading third-party sources. The core information products target three key areas of identified information need, including medical literature (MEDLINE), medical diagnosis (QMR), and drug information (USP). *Physicians' Online* is being developed in cooperation with major medical societies, pharmaceutical manufacturers & marketing organizations, hospitals, managed care organizations, and leading technology & third-party content providers.

Implementation: 1993 through 1994

Phase II - Prescription Management

Online prescription fulfillment and cost containment programs made possible through the use of "Smart Electronic Prescription Pads" (PDAs). This network is being developed in cooperation with managed care organizations, hospitals, pharmacists, pharmaceutical distributors, leading technology providers, and other health-care participants.

Implementation: 1994 through 1996

Phase III - Patient Management

Online patient information for efficient retrieval and transaction processing resulting in enhanced clinical and administrative efficiency and cost-containment. This network is being developed in cooperation with corporate employee benefits programs, private health insurance carriers, out-patient laboratories, electronic claims processors, installment credit organizations, hospitals, and other health care participants.

Implementation: 1995 through 1997

The Company's competitive advantage is based on its ability to attract physician use. Founded by practicing physicians with extensive experience delivering practical information products to busy clinicians, the Company has developed a market-driven product strategy designed to win maximum professional acceptance and use. The Company is establishing critical strategic alliances with leading participants in every major health care market segment. The Company is currently working with several leading content and service providers to develop new products and services for this expanding multi-billion dollar market opportunity.

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Physicians' Online: 5 Year Plan

To empower physicians with the tools essential to advance the quality and control the cost of health care through informed decision-making.

	Phase I	Phase II	Phase III
Time Frame	0 - 2 yr	1 - 4 yr	3 - 5 yr
Essential Tools	Medical Knowledge Management	Prescription Management	Patient Management
Vehicle	Physicians Online	Physicians' Prescribing Network Pharmacists' Online Pharm Reps' Online Managed Care Online	National Health Card Network
Potential Membership	600,000 physicians 10,000 pharmaceutical execs	450,000 physician 75,000 pharmacies 50,000 drug reps	250 million patients 10,000 hospitals other health care participants
Core Markets	MEDLINE Rx Micromarketing	Prescription Fulfillment Rx Cost-Containment	Patient Administration Cost-Containment Programs
Market Size	\$50 million / \$7 billion	>\$70 billion	>\$500 billion
Market Size/MD	\$1000 / \$15,000	>\$150,000	>\$1,000,000
Secondary Markets	<ul style="list-style-type: none"> Clinical Databases Decision-Support Tools News & Financial Services Special Interest Forums other areas of identified need 	<ul style="list-style-type: none"> Home Care Managed Care Pharmacy Network "Electronic Detailing" & Rep Support 	<ul style="list-style-type: none"> Electronic Patient Record Outpatient Laboratory Transactions Patient Health Maintenance
Main Revenue Sources	<ul style="list-style-type: none"> Pharmaceutical Advertising Pharmaceutical Micromarketing Information Membership & Usage Fees 	<ul style="list-style-type: none"> Prescription Processing Micromarketing Information Membership & Usage Fees 	<ul style="list-style-type: none"> Patient Transaction Processing Communication Services Micromarketing Information Membership & Usage Fees
Competitive Advantage	<ul style="list-style-type: none"> "Medical Info Vending Machines" Sophisticated MD Targeting ("Ad Wizard"/ "Smart Ads") Installed Terminals, PDAs, & PCs Computer-Sophisticated Members Medical Society Support Pharmaceutical Industry Support Third-Party Office Systems Support Pharmaceutical Executives' Online User-Friendly Interface Proprietary Text-Retrieval Software Proprietary Psychometric Mktg Data 	<ul style="list-style-type: none"> "Smart Electronic Prescription Pads" (PDAs) Installed Terminals, PDAs, & PCs Automated Prescriber Assistance Programs Proprietary managed care applications National Electronic Formulary Proprietary Prescriber Profiling Patient Prescription Profiles/ DUR Proprietary Psychometric Marketing Data 	<ul style="list-style-type: none"> "National Health Card" Installed-base of diverse POS/PON entry-points linking integral industry participants Electronic Patient Transactions Network Third-Party Office Systems Support Hospital Systems Support Cellular Communications link to Physicians
Strategic Alliances	<ul style="list-style-type: none"> Medical & Professional Societies Pharmaceutical Companies Pharmaceutical Marketing Cos Prescription Data Marketing Companies (IMS/ MMG/ PMS) Third-party Content Providers (NLM/ Camdat/ USP/ CAMD/ Insurance cos) Medical Office System Companies Technology Partners (CompuServe/ Sybase/ Conquest/ Coconut/ Apple/ Sun/ HP/ Cube) 	<ul style="list-style-type: none"> Prescription Fulfillment Companies (Medco/ McKesson/ Value/ etc) Pharmacies/Pharmacist Societies Managed Care Organizations HMOs/ PPOs/ IPAs Hospital Chains Hospital Formularies Corp Employee Benefits Programs Medical Office System Companies Technology Partners (AT&T/ Apple/ EO/ General Magic/ Motorola/ HP/ ARDIS) 	<ul style="list-style-type: none"> Corp Employee Benefits Programs Private Health Insurance Carriers BC/BS/Medicaid/ Medicare Out-Patient Labs (MetPath/ BioScience/ SKF/ NHL) Outpatient Testing Companies Installment Credit Organizations Electronic Claims Processing & Clearing Houses (NEIC/ EDS) Medical Office & Hospital Systems Companies
Critical Technologies	<ul style="list-style-type: none"> Systems Integration of existing hardware & software technology Packet Data Network technology Simple Text Retrieval Software Third-party Content Development 	<ul style="list-style-type: none"> "Personal Digital Assistants" (PDAs) Data network technology Proprietary PDA applications development Personal Info Management (PIM) 	<ul style="list-style-type: none"> Systems Integration Proprietary patient administration & cost-containment applications development Cellular data network technology
Infrastructure Milestones	<ul style="list-style-type: none"> 150,000 physician members 5,000 hospital members 5,000 hospital-based terminals 5,000 PDAs in Physician Offices 150,000 additional POL software installations 	<ul style="list-style-type: none"> 450,000 physician members 10,000 hospital members 20,000 hospital-based terminals 450,000 PDAs 500,000 additional POL software installations 	<ul style="list-style-type: none"> 600,000 physician members 10,000 hospital members 50,000 hospital-based terminals 600,000 PDAs 800,000 additional POL software installations
Infrastructure \$	\$10,000,000	\$250,000,000	\$500,000,000
Infrastructure/ MD	\$100	\$500	\$1000

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BUILDING A WIRELESS FUTURE

It started with cellular phones. Now, new gadgets and networks are transforming communications

At the dawn of the cellular-phone era a decade ago, American Telephone & Telegraph Co.'s market researchers predicted that, by the turn of the century, about 900,000 mobile phones would be in use in the U.S. Not even close. With the millennium still seven years away, that number has been exceeded—12 times over.

America's rapid embrace of cellular—repeated around the globe—has created, almost overnight, a \$15 billion-plus industry. Now, new technologies such as digital cellular and personal communications networks (PCNs) hold the promise of explosive growth in wireless markets for the remainder of the decade and beyond (table). And after first grossly underestimating the phenomenon, AT&T and other big players in communications, computers, consumer electronics, and information services are pursuing the market with the fervor of converts.

Over the next few years, companies ranging from AT&T and IBM to L.M. Ericsson and Matsushita Electrical Industrial will invest billions to create a new world of wireless communications.

AT&T last year agreed to pay \$3.8 billion to buy one-third of McCaw Cellular Communications Inc., the leading cellular carrier. Sprint Corp., the No. 3 long-distance carrier, paid \$4.7 billion for Centel Corp., mainly to get that company's cellular properties. Motorola Inc. is looking for partners to help fund Iridium, a \$3.8 billion satellite system that would allow wireless calls anywhere on earth. And two deep-pockets alliances—Ardis and Ram Mobile Data—are building national wireless data networks.

QUICK FIX. Meanwhile, more than 100 companies and groups—including cable-TV operators—have applied to the Federal Communications Commission to operate PCN systems. A twist on cellular, PCN would use hundreds of micro-cell transmitters to blanket a calling area and provide more than 20 times the capacity of conventional cellular. The pocket-size phones of PCNs will be cheaper than cellular phones and might serve as cordless phones indoors and mobile phones outdoors. PCN calling fees also are expected to be lower than cellular. Some investors and ana-

lysts predict PCN could compete with the wired nets of local phone companies. In Eastern Europe and elsewhere, wireless is being used to modernize phone service quickly—avoiding the time and expense of stringing wires (box, page 60).

There's also a scramble to create the hardware and information services to take advantage of the new invisible infrastructure. Alone and in groups, giants such as IBM and Motorola are designing wireless-phone and computer combinations. To build its Newton, a handheld "personal communicator" and organizer, Apple Computer Inc. has teamed up with Japan's Sharp Corp. The personal-computer maker is also collaborating with Germany's Siemens to tie office phone systems to Newton. A competing group, including AT&T, Matsushita, and Olivetti, is backing EO Inc., another maker of personal communicators. Chipmaker Intel Corp. is working with Swedish phone-equipment maker Ericsson. In software, Apple spin-off General Magic Inc. has signed AT&T and others to back its Telescript program as the lingua franca of wireless networks.

Driving this whirlwind activity is a vision of "anytime, anywhere" communi-

SPEED CHECK

SYMBOL TECHNOLOGIES

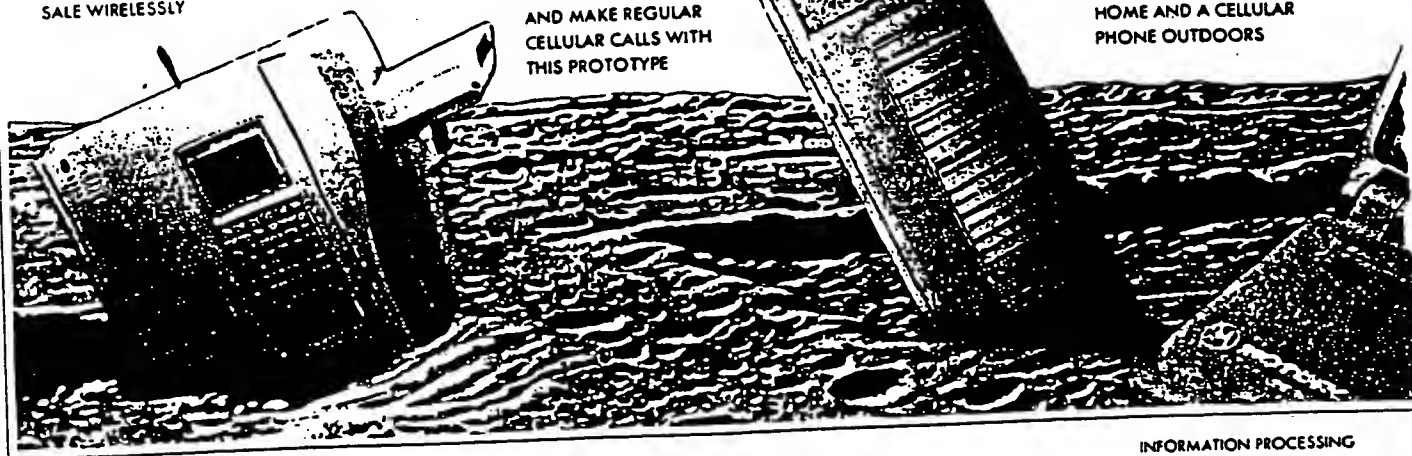
▼ STORE CLERKS CAN SCAN IN THE PRICE, TAKE A CREDIT-CARD PAYMENT, AND RECORD THE SALE WIRELESSLY

PERSONAL COMMUNICATOR IBM

► ON THE GO, YOU COULD RECEIVE E-MAIL AND MAKE REGULAR CELLULAR CALLS WITH THIS PROTOTYPE

DIGITAL PERSONAL COMMUNICATOR MOTOROLA

► A POCKET MODEL THAT'S CORDLESS AT HOME AND A CELLULAR PHONE OUTDOORS



cations. The premise is that wireless digital networks, feeding information to powerful handheld phone-computer-fax hybrids, will alter the way people live and work—redefining what's a workplace, a store, or a library. Using a personal communicator, you might trade stocks while sitting on a train, order a pair of gloves from an electronic L.L. Bean catalog while riding on a ski lift, or look up a legal precedent from a computerized law library while lolling in your backyard. "You'll have incredible power in your pocket at a very low cost," says Robert M. Kavner, an AT&T group executive who is helping to lead the phone company's charge into the wireless age.

SEA CHANGE. As the surprising popularity of cellular shows, the shift to wireless is a more powerful force than anybody realized 10 years ago. Now, Kavner and other enthusiasts say it may turn out to be a shift as profound as the move from gaslight to electric bulbs, trains to airplanes—or mainframes to PCs. "The last 100 years have been the wireline century," says Thomas E. Wheeler, president of the Cellular Telecommunications Industry Assn. "We have just embarked upon the wireless century."

That assumes, of course, that the new networks fall into place smoothly.

That's a big "if." First, it will cost billions of dollars and take years to upgrade today's analog cellular networks to digital technology. And Washington has yet to allocate the radio spectrum needed for PCN systems.

Doling out spectrum space could be done quickly through auctions, a move the Clinton Administration now backs. Auctions would replace time-consuming competitive hearings or the lotteries that created windfalls for lucky winners in the early days of cellular. Opponents of auctions worry that big companies might buy up much of the spectrum at the expense of small ones, but supporters say companies with promising technology should be able to get the necessary funding to bid.

Perhaps the biggest question mark is the health issue. Early this year, the cellular industry was rocked by reports suggesting that handheld cellular phones might be linked to brain cancer. Evidence connecting radio emissions with any form of cancer remains inconclusive, but the scare has the cellular in-

ARDIS TERMINAL MOTOROLA

► TECHNICAL STAFF CAN KEEP IN TOUCH WITH HEADQUARTERS VIA THIS WIRELESS MESSAGE NETWORK

IRIDIUM PHONE MOTOROLA

▲ LOOK OUT, WORLD. THE IRIDIUM SATELLITE SYSTEM WOULD ALLOW CALLING ANYWHERE ON EARTH

AT&T-EO COMMUNICATOR EO

▲ LOOK MA, NO KEYBOARD: A PHONE-FAX-COMPUTER HYBRID THAT READS HANDWRITING

NEWTON

APPLE COMPUTER

► THIS PERSONAL DIGITAL ASSISTANT EVENTUALLY WILL HANDLE WIRELESS FAXES AND E-MAIL



Information Processing



"You'll have incredible power in your pocket at a very low cost"—a shift as big as from gaslight to electric bulbs

ROBERT M. KAVNER
AT&T group executive

parts inventories. Back at headquarters, wireless computer networking will make it a snap to move a PC from one office to another.

Even low-tech equipment will go wireless.

Tiny radios on boxcars, freight containers, and truck trailers will help shippers pinpoint deliveries of goods, as they make their way across countries or oceans. Also, it may soon be economical to install transmitters in soda machines to relay information such as how many cans are needed of each beverage.

The bottom line: "There's a very clear-cut productivity argument," says George M. C. Fisher, chairman of Motorola. At Pitney Bowes Inc., for example, 3,500 copier-repair people now carry \$2,500 wireless data terminals connected to the wireless Ardis network, a joint

venture of Motorola and IBM. Originally created for IBM's technicians, the setup not only tells workers what and where the next assignment is but also dives into a data base for such information as the date of the last repair and the name of the person to see. Before, Pitney Bowes reps phoned in and arrived with "whatever information they could scribble on their hand or the back of a pad," says Murray D. Martin, president of Pitney Bowes Copier Systems.

Now, technicians arrive with all the necessary information. And if they need a part from the repair depot, they can order it over the Ardis system and have it delivered. Martin figures the system has improved productivity 12% to 15% and raised customer satisfaction. But it came at a price: about \$130 million, including a computerized dispatch setup.

GETTING SET. So far, only a few pioneers have been willing to pay such high prices for the benefits of wireless. Among them are the two package-delivery giants, Federal Express Corp. built its own private radio network, and United Parcel Service of America Inc. recently organized a national network by piecing together cellular-phone systems. But as costs plunge, thousands of other businesses will follow. Motorola, for example, predicts that by 2000, as many as 20 million U.S. workers will be walking around with wireless data terminals. Motorola estimates the market for such two-way wireless setups should hit \$5 billion then.

Corporate America seems ready. In a survey of 3,500 top executives by Deloitte & Touche, more than 90% said they expected wireless communications to boost productivity by the mid-1990s. At software maker Microsoft Corp., Nathan Myhrvold, vice-president for advanced technology and business development, sees

The change won't take place overnight. "It takes 10 years typically before a new product really takes off"

GEORGE M. C. FISHER
Motorola chairman



dustry racing to prove that a world of pocket phones and laptop computers with wireless modems will be safe. "If people are scared of having a radio next to their ear, do you think they'll be willing to have a radio in their lap?" asks one computer-industry executive.

Another issue: People already overwhelmed by junk mail, fax frenzy, and nonstop phone solicitation are apt to object to the intrusion of anytime-anywhere communications. There's also the question of privacy. To send calls to your pocket phone, PCN systems will need to know where you are. And cellular callers already worry about eavesdroppers who use police scanners to pick up their conversations. (Technologists say that won't be possible with forthcoming digital cellular systems.)

NOMADIC MAN. There's already one obvious market for these wireless wonders: the executives and professionals who were the first to take up cellular phones. Freed from the umbilical cords of computer wires, executives can keep up their frenetic travel schedules and still conduct business as if they were in the office. They'll be able to fire off faxes and electronic mail and read files from distant computers wherever they are—including planes. "Man started out as nomadic," says Craig O. McCaw, chairman of McCaw. "It may be the most natural state for human beings."

Wireless technology isn't just for the white-collar set, though. By bringing the latest information to employees wherever they roam, wireless data terminals have the potential to revamp the way service personnel and even production workers do their jobs. Repair people, for example, will have instant access to

the market for wireless data devices equalling the market for PCs—now about 30 million units a year.

Before this mass market materializes, however, there are hurdles to clear—both in technology and marketing. The most important technical developments center on the shift from analog to digital cellular. By converting the human voice to computer code, at least 10 times as many calls can be sent over the same slice of radio spectrum. Right off the bat, that should relieve service problems in such cities as Los Angeles, where too many cellular subscribers are often trying to get onto the airwaves at once.

Digital systems are already operating in parts of Europe, where a continent-wide common standard has been adopted. But in the U.S., a dispute over two proposed technologies has delayed the shift. One, called time-division multiple access (TDMA), is ready and would boost capacity up to sixfold by slicing cellular voice channels into split-second time slots, then sending digitized calls in tiny bursts. But just when the cellular industry decided on TDMA, another system appeared. Called code-division multiple access (CDMA), it promises to expand capacity by a factor of 10 by breaking a call into digital "packets," then assigning a computer code to each. The packets are intermingled with packets from other calls and unscrambled at the receiving end. But until the technology dispute is settled, the old-fashioned analog system may be the only nationwide network.

When the digital networks are in place, however, the speed and reliability of sending data should improve dramatically. Cellular operators have already endorsed a format called cellular digital packet data (CDPD) to improve data communications over existing analog networks. Based on an IBM-developed technology, it allows data to "hop" between channels that are not being used for voice traffic.

In the meantime, makers of phones, computers, and consumer-electronics products are working on designs for

the gadgets we'll carry around in the wireless world. The most talked-about has been Apple's Newton. This calculator-size device, due out by this summer, will combine the functions of a pocket organizer, such as a calendar and a to-do list, with communications features such as the ability to send and receive faxes. Because Newton has no keyboard, users will write on its screen with a special pen. Software will "read" the writing and act on instructions, Apple says. Newton also will capture handwritten notes to be sent as faxes.

ALL IN ONE. The gallons of ink spilled over Newton have raised some red flags about the move to wireless. "There's more hype than there'll be revenue, at least in the next few years," cautions IBM wireless researcher Satish Gupta. Competitors say that while Newton points to the possibilities of wireless, Apple may have created unrealistic expectations—for itself and the emerging industry. Not only has Apple yet to build a Newton, but when it does, the first version won't have most of the wireless

data-communication capabilities that CEO John Sculley has highlighted. "I think the bar has been set too high by the Sculleys of the world," says James C. Hobbs, a vice-president at BellSouth Mobile Data. Apple executives were unavailable for comment.

Even if you can't yet stuff all the necessary electronics into one handheld unit such as Newton, "the technology is all here," says Martin Levetin, executive vice-president at Ram Mobile Data, a service similar to Ardis. The challenge, he adds, "is assembling the pieces and making commercial products out of it."

For now, the solution is to carry two devices—one computer and one communicator. That's how users of the Ram system operate. They carry a Hewlett-Packard Co. 95LX pocket-size PC attached to a radio device from Ericsson-GE Mobile Communications. The \$995 package allows executives to send and receive short text messages almost anywhere. Soon, with help from Intel and other chipmakers that are shrinking the communications electronics, it will be possible to do this with one device, such as a notebook PC or personal communicator.

Titus & Sons, a medical-supplies distributor in City of Industry, Calif., is trying out one of the first personal communicators in production. Built by EO, the notebook-size machine stores product information and can send or receive wireless faxes. It also doubles as a cellular phone. The device "is essentially the office we don't have in the field," says Don Durben, a Titus salesman.

Investors in new wireless networks and hardware figure that millions of executives and workers will eventually want such mobility. But it won't happen overnight. "It takes 10 years typically before a new product really takes off," says Motorola's Fisher. In addition to technical issues, there is price. The EO personal communicator with the cellular-communications option, for instance, costs about \$2,800. Apple says Newton will be priced somewhat under \$1,000. Experts say a mass

BUILDING BLOCKS FOR THE WIRELESS WORLD

Some of the technologies being developed for a new era of communications

DIGITAL CELLULAR By moving from today's analog system to new digital technology, cellular phone-system capacity will expand dramatically, and data communications via cellular will become easier

PERSONAL COMMUNICATIONS NETWORKS, OR PCNs A system of cheap packet phones using "microcell" radio transmission that eventually could replace wired phones, even in the home

SATELLITE PHONES These systems, such as Motorola's proposed Iridium service, would ring the earth with low-orbit satellites to connect calls to any point on the globe

CELLULAR DIGITAL PACKET DATA An enhancement planned for today's analog cellular phone systems to allow "packets" of data—electronic mail, for example—to "hop" between temporarily free voice channels

PACKET RADIO These systems, such as Ardis from IBM and Motorola and Ram Mobile Data from BellSouth and Ram Broadcasting, allow two-way, data-only communications to handheld devices

PERSONAL COMMUNICATORS

The first models, such as those from AT&T/EO and Apple Computer, appear this year.

Think of them as mobile PCs of the wireless age

WIRELESS COMPUTER NETWORKS

Linking PCs and other computers by radio wave eliminates miles of costly, confusing cables and makes it much easier to reconfigure systems



Information Processing

market won't materialize until gadget prices drop below \$500.

Even then, the demand will depend a great deal on the types of wireless services available. Information providers such as Mead Corp. say they want to send their computerized data, such as newspaper and magazine stories, over the airwaves. But none has yet announced a concrete plan. In the process of launching wireless services, "there will be a lot of players who will lose money," predicts Dennis Patrick, the former FCC chairman who heads Time Warner Inc.'s wireless efforts.

Steep costs, high risks, and the need to set standards are already pushing wireless pioneers into complex alliances. "We're partnering with some of our future competitors in order to make this world happen," says AT&T's Kavner, who has managed the phone company's partnerships with EO and General Magic. Among backers of either or both are such potential AT&T rivals as Matsushita, Motorola, and Sony.

One big motivation behind such strange-bedfellows relationships is the fear of getting stuck with a Betamax product or service in a new VHS world. Without cooperation, it "will stunt the growth of the industry," says Frank T. Wapole, chief executive of Ardis. Cooperation may also be critical in getting federal regulators to dole out the needed airspace for wireless services.

BIG BOYS' GAME. Even as they team up, however, the major players in computers and communications are jockeying to become the big wheels in the wireless world, too. Motorola is perhaps the best positioned, since it's among the largest makers of cellular-transmission equipment, cellular phones, and pagers. It also owns pieces of wireless networks in the U.S. and abroad. And it's working on personal communicators.

Motorola has AT&T to contend with, though. The phone giant plans to market McCaw's cellular service using the powerful AT&T brand. And AT&T has bigger plans than McCaw. "It's not just cellular we're interested in, it's all of wireless," says Victor A. Pelson, an AT&T group executive who heads its communications services business. That's why the company plans to test PCN systems over its old microwave long-distance towers, which have been little used since the move to optical fiber. AT&T's stated goal is to be the leading provider of "anytime, anywhere" communications.

And Apple isn't the only computer giant that is aiming for the wireless world. Although wounded by its recent financial troubles and executive-suite turmoil, IBM is making substantial commitments to wireless. In addition to its half-inter-

est in Ardis, it has a prototype personal communicator and is developing wireless PC networks. In addition, IBM is expected to take a stake in In-Flight Phone Corp., the Oak Brook Terrace (Ill.) developer of a digital air-to-ground phone system founded by wireless pioneer John D. Goeken.

So the race to make a wireless world has begun. The biggest players in the

computer, communications, and information industries anticipate a new stage in technology, which, as the microprocessor did in the 1980s, will create vast new markets and new fortunes. They see empires in the air.

By Bart Ziegler in New York, with Mark Lewyn in Washington, Robert D. Hof in San Francisco, Lois Therrien in Chicago, and bureau reports

FOR EMERGING COUNTRIES, CELLULAR IS NO LUXURY

Two years ago, the Hungarian village of Uri, 25 miles south of Budapest, was in trouble. Most of its 2,700 residents were thrown out of work when the truck-parts factory went bankrupt. Their best hope: Jozsef Nagy's electrical-fixture factory. But the town had only one phone—a hand-cranked model—so Nagy had to spend seven days a week driving around taking orders. After paying \$2,300 for a cellular phone, however, orders started



HUNGARY: LAMP SALES BY MOBILE PHONE

coming to him. Today, he runs a 400-employee, \$2.5 million business, mostly from his red Honda Accord. Back in the office, he has four more mobile phones. "Without the phones," Nagy says, "we'd all be dead ducks."

Mobile phones have become a basic survival tool for emerging nations. From Indonesia to Pakistan to the former Soviet bloc, cellular is quickly creating modern phone links. Upgrading old wired systems could take decades.

This summer, after four years and a modest \$85 million investment, Hungary's Westel Radiotelefon will finish its nationwide network. The joint venture of state-owned Hungarian Telecommunications Co. (HTC) and U.S. West Inc. has signed up more than 24,000 subscribers. For one-third of them, the mobile phone is their only one.

Nobody expected Westel to take off so quickly. "This was unknown territory," says General Manager András

Sugar. But it is rapidly becoming part of the fabric of daily life. Near Miskolc, in northeastern Hungary, dairy-men use Westel phones to drum up business for once-dying farms. In the rural district of Kunadacs, Dr. Kalman Farkas dispatches ambulances from his car phone: His region of 140 square miles has only 30 wired phones. "We're saving lives," he says.

GO-GO ECONOMY. Westel has been an unexpected boon for U.S. West, which owns 49% of the venture. At 1,000 a month, customers are signing up twice as fast as expected and are talking more than 6 hours a month, or three times the Western average for cellular callers. In 1992, Westel more than doubled its revenue, to \$60 million, and broke even in 1991—two years ahead of schedule. Steven E. Andrews, head of U.S. West's non-U.S. wireless operations, figures his \$10 million investment could return 20% to 30% pretax over 10 years, up to twice what it earns at home.

Encouraged by results in Hungary, Andrews has aggressively pursued other franchises. U.S. West now has deals in the Czech and Slovak republics and in Moscow, St. Petersburg, and 11 other Russian cities, making it the biggest cellular player in Eastern Europe. New opportunities include a chance to run one of two new digital cellular nets in Hungary. U.S. West is also likely to be a bidder when the government sells off about 30% of HTC next year.

For ordinary Hungarians, who earn \$250 a month, \$2,000 for a handset and \$1,000 in hookup fees put cellular phones out of reach. But for entrepreneurs in Hungary's go-go economy, no price is too high. Like Nagy, three quarters of subscribers use the phone to run businesses, and 14% say they would go bankrupt without them. "We were hungry," he says, "for something we never knew we were missing."

By Jonathan B. Levine in Budapest

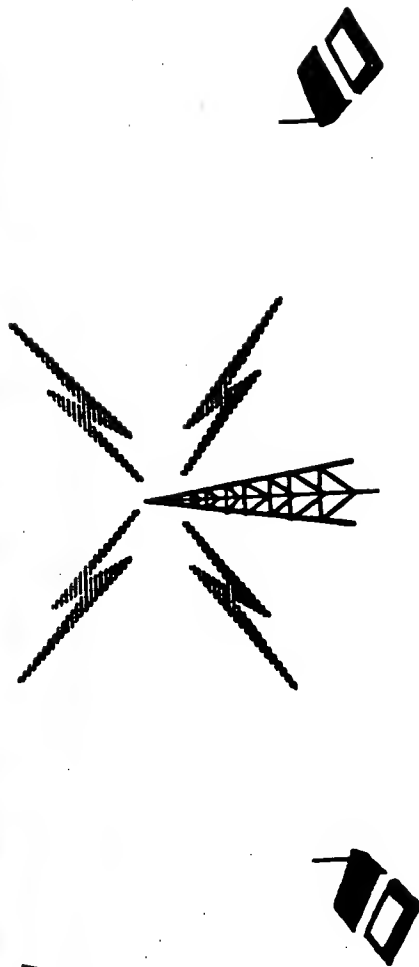


MOTOROLA

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1993 Spring Developers Workshop - April 29, 1993

Overview



- Wireless Applications
- Radio Service Discussion
 - Ardis Presentation
 - RadioMail Presentation
- Wireless Application Development Discussion

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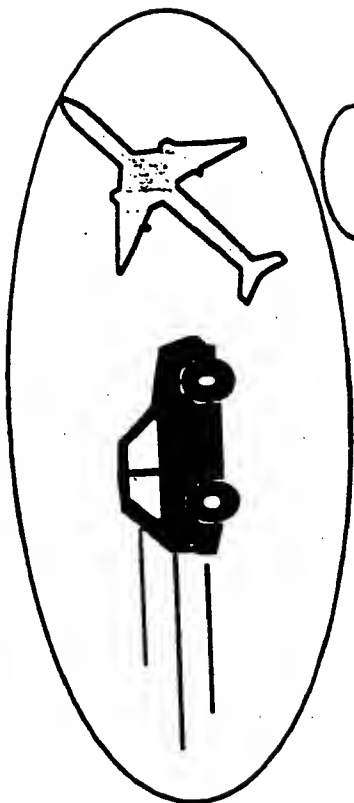
*Personal Messaging Products
Paging and Wireless Data Group*



Motorola Confidential Proprietary

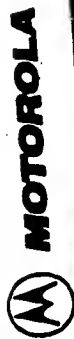
1993 Spring Developers Workshop - April 29, 1993

Wireless: "The Freedom Facilitator"



- Messaging
 - Email
 - Scheduling
 - Database Access
- Access to Information Providers
 - News, Weather, Sports
 - Financial Information
- Access to Services
 - Financial Services (stock trades, ...)
 - Online Reviews (restaurants, movies ...)
 - Electronic Shopping

Personal Messaging Products
Paging and Wireless Data Group

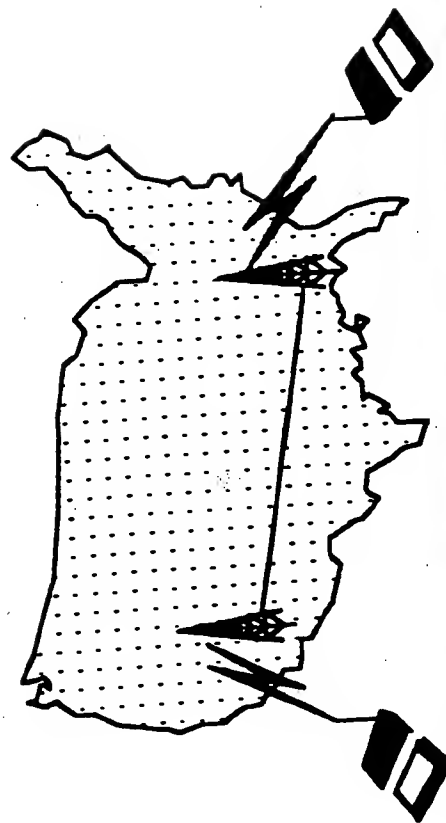
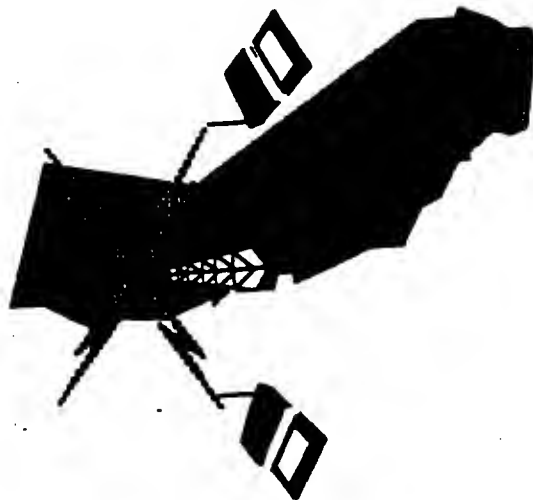


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1993 Spring Developers Workshop - April 29, 1993

Local & Nationwide Applications

- Availability & Coverage
 - Local Coverage
 - Nationwide Coverage with Auto Roaming
- Usage is transparent between devices regardless of physical location
- Devices can be used anywhere there is coverage



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Personal Messaging Products
Paging and Wireless Data Group



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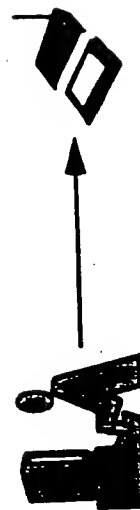
Types of Applications



- Peer-to-Peer
 - General messaging
 - Application-to-application
 - Schedule exchange & resolution
 - Collaborative applications



- Peer-to-Host
 - Database access
 - Wireless Email
 - Services interaction (get latest weather...)
 - ATT Magicmail gateway



- Host-to-Peer
 - Sales Catalog pricing updates
 - Travel itinerary update

Personal Messaging Products
Paging and Wireless Data Group

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NEWS RELEASE

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ARDIS SETS THE STANDARD FOR WIRELESS DATA COMMUNICATIONS

LINCOLNSHIRE, Illinois -- Today, ARDIS is increasing the productivity of thousands of mobile workers by bringing them real-time information solutions through the power of wireless data communications. As the preeminent wireless data network in the world, ARDIS has set the standard for providing mobile professionals with immediate access to the information they need wherever they are.

The brief history of ARDIS signals the tremendous growth of one of the hottest markets of the 1990s. Formed as a joint venture between industry giants IBM and Motorola in April 1990, ARDIS took over commercial operations of networks which had been deployed by the two companies and in production use since 1984. Today, ARDIS has more than 60 customers and 30,000 users on the network and is adding hundreds every month. ARDIS serves the top 400 metropolitan areas and provides wireless coverage in more than 8,000 cities and towns in the 50 states, Puerto Rico and the Virgin Islands.

"Just a few short years ago, wireless data communications only existed as an idea," said ARDIS President Frank Wapole. "Now we predict that there will be millions of users by the end of the decade."

- more -

A Partnership of IBM and Motorola

THB 06028

ARDIS/BACKGROUNDER
Page 2

The wireless explosion

The advances in portable computing have fueled the explosive growth of the wireless data communications market. The increasing capabilities of small, lightweight portable computers make it possible for a mobile worker to easily receive, manipulate, store and send information in the form that best suits their needs. A salesperson, for example, uses a portable wireless computer to file orders, check inventories, write and check E-mail and create sales presentations.

Cliff Bean of Arthur D. Little, Inc., a highly respected industry research and consulting firm, believes that mobile data applications will grow more than tenfold over the next five years for a current base of several hundred thousand users.

According to Wapole, the ability to send and receive unlimited amounts of text, graphics and images quickly from anywhere in the world is in the not-too-distant future. "The exciting thing is not the technology itself but the multitude of ways that it solves real life business problems," Wapole said. "It's not hard to envision a vast array of applications for wireless."

In a move to dramatically accelerate the growth of wireless data communications, Motorola announced in March 1992 their decision to open the protocols used on the ARDIS network. The open network interface will encourage manufacturers to market ARDIS-compatible products, providing more alternatives for the customer. Telxon, IBM, Motorola, Fujitsu, Itron and AT&T Safari Systems have announced their plans to market products with integrated ARDIS communications capability.

- more -

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Customers

ARDIS has played a leading role in bringing the power of wireless technology to innovative, industry-leading companies. During its first year, the company built an impressive list of 35 customers and signed multi-million dollar customer contracts with Otis Elevator, Pitney Bowes and NCR Corporation. Today, its customer base spans a variety of industries including field service, field sales, transportation, public safety, communications and insurance, serving customers such as United Parcel Service, AVIS, Household Finance, AT&T, New York Department of Transportation, and Maersk.

AVIS Rent-a-Car, uses ARDIS to expedite the rental process for customers. AVIS drivers use an on-board computer to key in the customer's Wizard number, and in less than the time it takes to drive to the lot, the computer tells the driver the color, make and model of the customer's car, as well as its lot location.

"ARDIS made it possible for us to dramatically increase customer service. Now more of our customers spend less time at the airport," said Robert Salerno, senior vice president/general manager for AVIS.

The ARDIS network

As the first nationwide wireless data network, ARDIS has in place a sophisticated network structure that allows mobile workers to access powerful applications via portable computers wherever they are located. Available 24 hours a day, seven days a week in more than 400 U.S. metropolitan areas, the ARDIS network provides on-street and in-building coverage through its more than 1,250 base stations. Its primary network

- more -

operation facility is located in Lexington, Kentucky with two additional hubs located in Chicago and Los Angeles.

To increase the network's capacity and speed, ARDIS is implementing the first phase of a \$150 million network enhancement which will deploy Motorola's 19.2 Kbps protocol system. The expansion, initially directed to the top 30 metropolitan areas, will support automatic roaming, allowing users to maintain instant communications with peers or their company information systems as they travel from city to city.

"If we're going to maintain our leadership status as the world's largest and most advanced wireless data network, we must anticipate and meet current and future demand," Wapole said. "This expansion is driven by that commitment."

Strategic Business Partners

ARDIS has formed partnerships with leading software and application developers to provide turn-key solutions for companies looking for ways to increase the productivity of their mobile workforce. By offering ARDIS-compatible applications, the partnerships leap-frog the time-intensive and expensive application development process allowing customers to realize the benefits of wireless data communications immediately.

ARDIS has named several software application developers as Value Added Marketers (VAM), a business partnership arrangement covering a cross-section of industries including field service, field sales, insurance, transportation and public safety. Service Systems International, Ltd., Business partner Solutions Inc., AST/The DATA Group, Carrier Logistics, Synergistic Systems, Carrier Logistics, and ADP Automotive Claims Services are companies that have formed alliances with ARDIS.

- more -

ARDIS/BACKGROUNDER
Page 5

ARDIS value-added services

Formed with a core team of proven wireless communications experts, ARDIS provides its customers with a depth of support services. ARDIS provides its customers field technical support, system design support, training and implementation services to ensure the right solution is put into place.

The future

Today, ARDIS is delivering more than 40 million messages each month to and from field personnel providing information critical to their business. In the very near future, ARDIS will help truckers navigate and check traffic status while in route. ARDIS will enable vending machines to automatically notify distributors before they are empty, and enable residential security systems to alert police or fire departments. Individuals will communicate with family, friends and co-workers, and handle personal banking transactions.

"Today, these applications are possible using the ARDIS network. It's not an issue of whether the technology is available, but how the technology is applied to meet the needs of real people," said Frank Wapole. "Our goal is to be the leading enabler of wireless data solutions to meet the needs of millions of people worldwide."

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Physicians' Online

TM

Physicians' Prescribing Network

DRAFT 1.1

CONFIDENTIAL

Steven Hochberg
President & Chief Operating Officer

Christian Mayaud, MD
Chairman & Chief Executive Officer

May 1993

PHYSICIANS' ONLINE, Inc.
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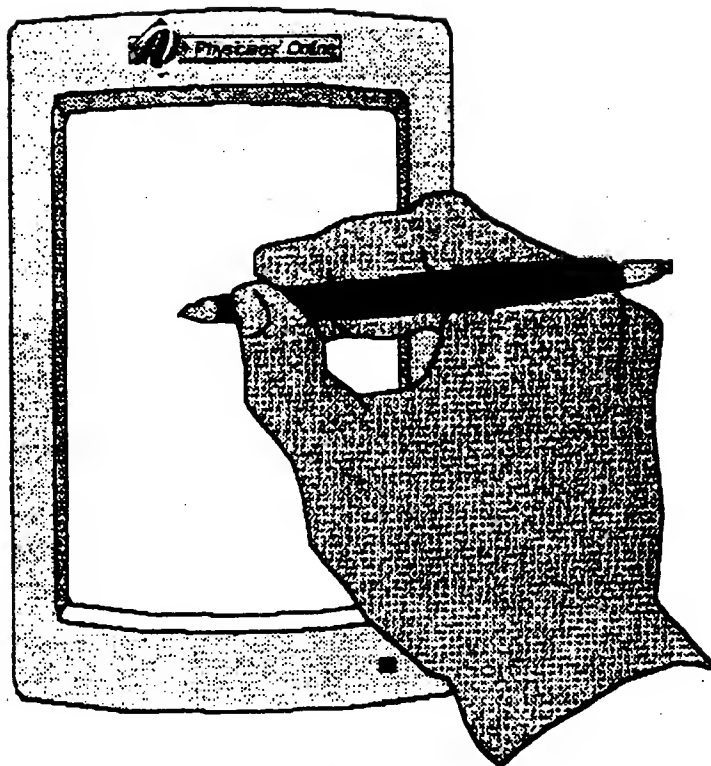
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Physicians' Prescribing Network

Physicians Prescribing Network (PPN) is an online interactive prescription drug ordering system linking physicians with pharmacists and mail-order suppliers via an industry-supported EDI network. PPN provides patients and prescription-drug-benefit plan sponsors the ability to minimize out-patient prescription costs by providing physicians with point-of-need information resources. PPN is designed to complement existing distribution and claims processing networks by linking them directly to the physician.

The convergence of escalating health care costs and the advance of information technology has paved the way for the formation of PPN. While there are a few companies that currently provide pharmaceutical benefit programs for plan sponsors, none have identified a cost effective means of linking the out-patient physician with their well-developed cost-containment and utilization information systems. PPN has developed a cost-effective means to create the required link to the physician.

By creating an industry-wide network, PPN will link physicians, on a wireless basis, directly into all pharmaceutical benefits programs. This linkage will create the tools to empower the physician to increase the quality and lower the cost of prescription drugs in the \$40 billion out-patient prescription drug market. These tools include an online formulary, online prospective drug utilization review, electronic transmission of prescriptions to pharmacists, and online access to other information and services.

PPN will provide physicians with the necessary hardware, while the pharmaceutical benefits programs will pay PPN a transaction fee for each prescription. While certain pharmaceutical drug programs may consider creating their own proprietary network, PPN does not believe that a physician will use multiple systems and multiple input devices with multiple interfaces. Instead, successful implementation will require a single universal method to provide drug benefit program information to physicians during the normal prescription writing process. This industry-wide approach is designed to help physicians accept this new technology into their mobile work environment and to avoid the failures that other proprietary network efforts have experienced.

PPN is being organized by Physicians' Online, Inc. (POL), a personalized online medical information and communications service dedicated to empowering physicians with the tools essential to advance the quality and control the cost of health care through informed decision-making. Physicians' Online projects at least 20,000 physician members will be using its online reference, diagnosis, and treatment services by the beginning of 1994. Physicians' Prescribing Network will begin operations in 1994 with a potential membership of over 450,000 physicians. (see Appendix)

PPN is currently in discussion with every major pharmaceutical benefits company and several large physician groups regarding this effort. In addition, PPN is commissioning a health policy consulting group in Washington to study the impact of this effort.

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KEY FEATURES OF PHYSICIANS' PRESCRIBING NETWORK

1. PPN is designed by physicians for physician use. Member physicians can utilize the Network regardless of which plan sponsor or patient is involved.
2. PPN is open to all plan sponsors, physicians, retail pharmacists, and mail-order suppliers. However, since physicians will not use a system that does not include all plan sponsors, industry-wide participation is required.
3. *Smart Scripts* enables physicians to maximize patient and plan sponsor cost containment benefits by providing the relevant information during the time of prescription writing.
4. Formularies are continuously updated.
5. PPN lowers transaction costs by eliminating paperwork, waiting time, and avoiding miscommunication between pharmacists and physicians.
6. PPN security eliminates unauthorized prescriptions.
7. PPN provides prescription drug benefits providers, retail pharmacists and mail order suppliers with an ability to offer new products/services.
8. PPN utilizes wireless digital radio technology to assist mobile physicians.
9. PPN is hardware independent allowing for maximum access and changing technologies.
10. The initial hardware expense necessary to establish PPN will be minimized by spreading it across a broad industry alliance.
11. PPN is designed to integrate with claims processing information requirements.
12. PPN is designed to access patient record information.

MANAGED CARE OF PRESCRIPTION DRUG BENEFITS

With the public's concern about "runaway and increasing" costs of health care, numerous efforts are underway to lower such costs through programs focusing on practice utilization areas rather than the traditional price controls. In fact, programs that have focused primarily on price controls have been relatively unsuccessful so far because utilization has increased in such programs thus eliminating any benefits from price reductions. However, utilization management, particularly for patient management, requires physician participation and superior information management.

In the area of pharmaceutical drug benefit management, employers can separate out this benefit from the rest of its health care plan which currently account for about 7% of employers' total health care costs. By "carving out" and applying managed care techniques to the pharmaceutical benefit, the employer can better track costs, control utilization, decrease risk, and often lower the premium for the remaining health care benefits which are generally administered by traditional indemnity or managed care companies. Currently, approximately 20% of employers currently carve out pharmaceutical benefits.

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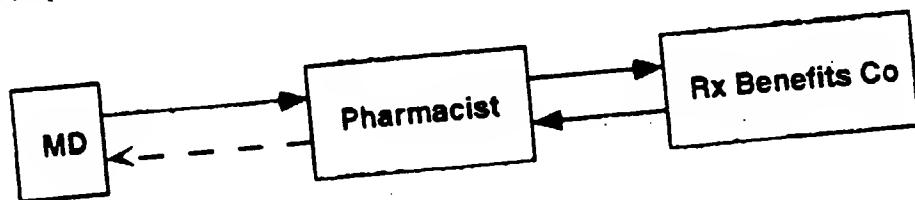
A major business opportunity for managed care companies has emerged through the intense need for management of rapidly growing pharmacy benefit costs, says Alex. Brown & Sons. In fact, the prescription drug segment of health care costs is one of the fastest-growing components of the health care equation that can equal one-third of total post-retiree health care benefits. While there are currently only a few national companies that compete in this segment, a significant investment in information technology is required to provide the following basic services.

Formulary: A formulary guides physician prescribing by listing drugs preferred for treating specific illnesses. Since there are several competing products in most therapeutic prescription drug classes, health care buyers, organizers and providers are beginning to identify their own preferred therapeutic substitutions through clinical review, chemical analysis, and negotiated supply agreements with different pharmaceutical manufacturers. While there are more than 6,000 prescription drugs available today, within 36 therapeutic classes, 110 drugs represent 80% of all prescription drug expenditures.

In each therapeutic category, the physician is given a choice of drugs to prescribe. Unless a patient has a medical need for a different drug, the most effective and lowest-cost option is the preferred prescription choice. Formularies can be mandated or used for prescribing guidelines. In 1992, about 30% of HMOs used formularies compared to 44% in 1990. In participating HMOs, formulary drugs are used to fill prescriptions about 87% of the time primarily involving staff physicians which are only responsible for one formulary.

The first problem facing out-patient physicians today is that with the plethora of prescription drug benefit plans, which currently only cover 50% of the out-patient prescription drug expenditures, formulary based cost-containment are ineffective if physicians have different patients on different plans and if they have no idea what are the preferred prescription choices when they write a prescription. This problem will continue to increase as patient coverage and the number of drug plans increase.

The second problem facing the formulary is that the feedback loop back to the physician is expensive and ineffective. First, the companies that manage the pharmaceutical benefit employ staffs of pharmacists to contact physicians when there is a potential therapeutic alternative. Unfortunately, this effort is retrospective and uses traditional communications channels which may not occur for several days after the prescription is written and may not result in a "counter-detail" of the physician because they still have the final decision-making responsibility. As more patients are covered by such plans, the communication with the physician is going to become more difficult as they have more patients and less time to respond.



Drug Utilization Review (DUR): According to Alex. Brown, "DUR monitors prescribing patterns to identify inappropriate or unnecessary prescription practices in three ways: (1) prospective review, which requires pre-authorization for specific drugs; (2) concurrent DUR, which adjudicates claims electronically and screens for adverse interactions as the prescription is filled; and (3) retrospective review, which assesses the patient's history to predict potential future adverse reactions to particular drugs or combinations of drugs over time."

Similar to the formulary, there is no current way to adequately inform the out-patient physician of any problems. Again, all communication is attempted on a retrospective basis.

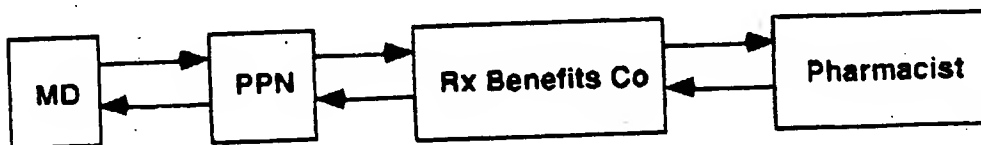
INFORMATION TECHNOLOGY AND PHYSICIAN USE

Since physicians are mobile professionals, the current information technology resident on the desktop or at the home is not very effective for point of service assistance. Fortunately, through the miniaturization of semiconductors, the development of software with "friendly" graphic user interfaces, and the ability to communicate through wireless devices, the physician can be linked into information systems that encourage utilization management and complement the mobile work environment. PPN will rely on a new class of electronic devices known as Personal Digital Assistants (PDAs). PDAs are low-cost easy-to-use pocket-sized pen-based computers which allow mobile professionals such as physicians to communicate from anywhere over wireless networks.

PHYSICIANS' PRESCRIBING NETWORK SERVICES

1. Online Formulary: With the cooperation of the leading companies that manage prescription drug benefit programs, PPN links the physician with the various formularies through an electronic prescription pad ("Smart Script") which helps the physician identify the preferred prescription choice at the point of prescription writing. PPN's proprietary Smart Scripts software allows for continuous updating of formularies and seamless integration into the prescription writing process.

No matter which plan a patient is covered by, while the physician is writing a prescription, he is made aware of any therapeutic alternatives at the appropriate time. This will obviate the need for pharmacists to retrospectively contact the physician about such alternatives.



2. Online Prospective Drug Utilization Review (DUR): Through the link with pharmaceutical benefit programs, a physician will be able to complete a prospective DUR by electronically accessing the patient's drug history. This review procedure can avoid duplication of therapy and avoid drug interaction and allergy problems.
3. Electronic Transmission of Prescriptions to Pharmacists: Through the link with the pharmaceutical benefit programs, the patient can direct the prescription to the retail or mail-order distribution outlet of their choice. This linkage will eliminate paper and patient time at the pharmacy.
4. Online access to other information and services: In addition, the pharmaceutical benefit programs can create additional services through the link with the physician. These services can include, full drug information, patient eligibility verification, patient instructions, sample ordering, refill alerts, and step therapy alternatives.

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PHARMACEUTICAL BENEFITS PROGRAMS

Pharmaceutical Benefits Programs are managed by a handful of companies which have invested hundreds of millions of dollars in information systems to provide Formulary and Drug Utilization Review capabilities for both large employers, HMOs and other plan sponsors. In fact, while HMOs may have ample purchasing power to pursue this business for themselves, millions of lives are necessary to recoup the cost of these investments. For example, FHP, one of California's largest and oldest HMOs, just entered into an agreement with one of the following companies to "buy" rather than "make" its pharmaceutical benefits program. These companies include (7):

Caremark, formerly a division of Baxter, is \$1.5 billion supplier of integrated services including drug benefits, home infusion, and physician services. The company's integrated drug benefit programs serve more than 8.0 million people.

Diversified Pharmaceutical Services (United HealthCare), a subsidiary of a national HMO, offers pharmacy networks and claims processing products that use group purchasing power and utilization control techniques to contain health care costs. United provides managed pharmaceutical care to approximately 7.5 million people in this subsidiary, which is one of the fastest growing segments of its business and now comprises about 15% of profits. Diversified's primary market is other HMOs.

Express Scripts is one of the nation's few fully integrated pharmacy benefit managers, servicing plan sponsors through a preferred network of retailers and an in-house mail-order facility. Founded by NY Life in 1986 primarily to manage its drug benefit for its 650,000 Sannu (HMO) subscribers, Express Scripts has branched out to nonrelated customers and now serves over 3 million people. Group purchasing, formulary compliance, and substantive drug utilization review contribute to savings of 25-35% on plan-sponsor pharmacy costs. Express has recently entered into a five year exclusive agreement with FHP, a California HMO.

Medco Containment Services is a leader in the pharmacy management business, serving 33 million people through integrated retail and mail-order pharmacies. Medco has integrated formularies, which allow its national customer base to benefit from exclusive, discount contracts with manufacturers for "preferred" cost-effective drugs, and aggressive drug utilization reviews. Medco is actually changing physician prescribing patterns through education. With this trend and the loss of the pricing pedal in the U.S. market, drug companies are rapidly recognizing Medco's ability to drive market share through active education of physicians of cost-effective alternative therapies. In response, they are entering into market-share-driven exclusive rebate contracts with Medco. In addition, Medco has added other special services such as employee assistance programs, mental health management and institutional pharmacy to serve nursing homes and prisons.

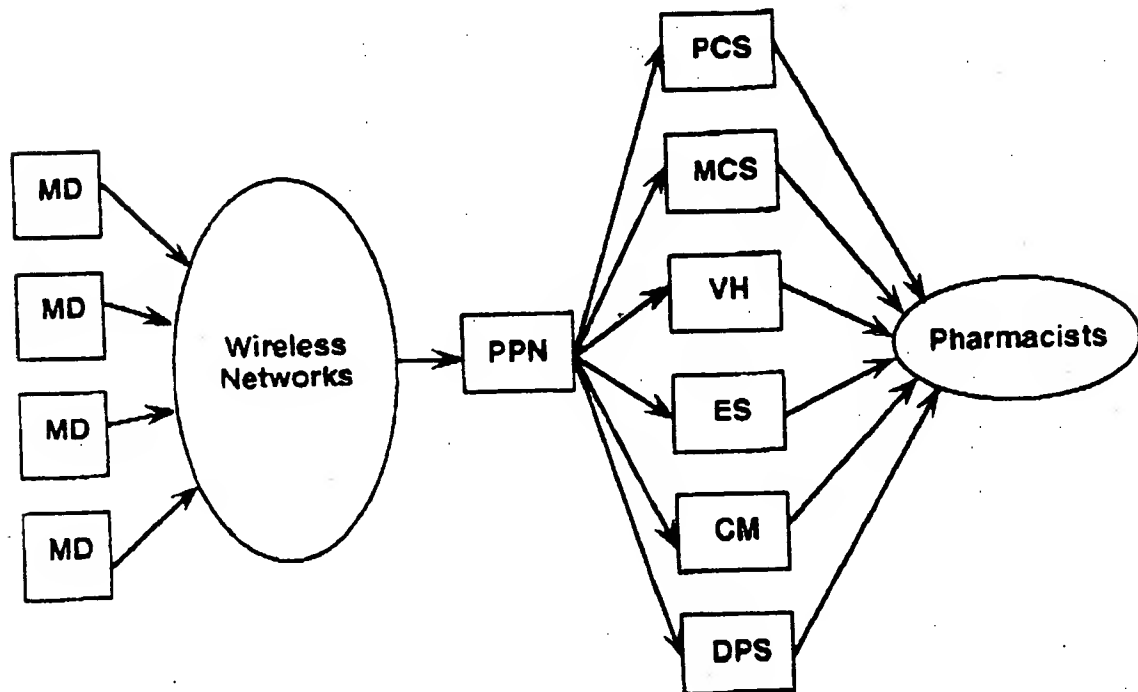
PCS Health Systems (McKesson) is the nation's largest processor of prescription claims, amounting to almost 25% of the out-patient drug market. While PCS's core business has been to supply traditional indemnity plans, the market is moving to managed care programs. PCS just recently acquired Clinical Pharmaceuticals, Inc. and its Clinical Pharmacy Advantage which provide integrated managed prescription benefits programs. In addition, PCS has been selected by the National Electronic Information Corporation to streamline the system and electronically process claims for this group of insurance companies. This puts PCS in the center of the development of important

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standards for the development of the electronic patient record. McKesson Drug Co. is the world's largest distributor of Pharmaceuticals and other health care products. McKesson had more than \$10 billion of total corporate revenues for 1992.

Value Health is the leading independent provider of managed care pharmaceutical products to large, self-insured employers through its ValueRx subsidiary, which presently serves about 7.5 million people, and accounts for about 70% of revenues. With more large employers migrating to self-insuring and to carving-out prescription benefits, Value has been aggressively increasing its product line to meet this growing market segment.



(*) Much of this information was obtained from Alex. Brown & Sons publications.

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PHYSICIANS' PRESCRIBING NETWORK

Organizational Planning

<u>Item</u>	<u>Participants</u>	<u>Dates</u>	<u>Req Funding</u>
Organize Physicians	P.O.L. Physician Groups	Current	NA
Organize Technology	P.O.L. General Magic Motorola/ARDIS Apple	Current	NA
• Prototype • System Design	ARDIS Bus. Partner Solutions	June 7	NA TBD
Study Cost Benefits	Lewin or other	Current	TBD
Organize Plan Sponsors • Collect Formulary Data	McKesson, Medco, Caremark, Divrsld, Express, Value, etc.	Current	NA
Review State Pharmacy Laws and Work with Boards/ Lawyers	LeBeauf, Lamb	Current	TBD
Develop Smart Script Software • Feature Design • Integration of Patient Record & Claims Processing	P.O.L. Medical Societies Genl. Magic Ref. NEIC	Current	TBD
Regional Pilot Test Program	Lenox Hill Hospital Others TBD	Fall '93	TBD
Hardware Devices to Top 5% of MD Prescribers	Motorola/Apple Private Investors	1Q '94	TBD
Hardware Devices To Remaining MD's	Capital Markets	2Q 94	TBD

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